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(54) Keying system for ink supply containers

Kodierungsvorrichtung für Tintenzufuhrbehälter

Dispositif de codage pour réservoirs d'alimentation en encre

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ponents of a preferred embodiment of the keying system of the present invention.

[0018] Figure 4 is a perspective view of part of a printer docking station that includes another component of a preferred embodiment of the keying system of the present invention.

[0019] Figure 5 is a top partial view of one wall of the docking station detailing part of the keying system of the present invention.

[0020] Figure 6 shows the ink supply of Figure 1 being inserted into a docking bay of a docking station.

[0021] Figure 7 is a cross sectional view showing the ink supply of Figure 1 fully inserted into the docking bay.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

[0022] An ink supply container that carries a component of the keying system of the present invention is illustrated in Figures 1 and 2 as reference numeral 20. The ink supply container 20 (occasionally referred to merely as ink "supply") has a chassis 22 that carries an ink reservoir 24 for containing ink. The chassis also carries a pump 26, and a fluid outlet 28. The chassis 22 fits within the lower open end of a hard protective shell 30. A cap 32 is affixed to the lower end of the shell. The cap 32 is provided with an aperture 34 to allow access to the pump 26 and an aperture 36 to allow access to the fluid outlet 28.

[0023] The ink supply 20 is inserted into the appropriate bay 38 of a docking station 132 of an ink-jet printer, as illustrated in Figures 6-7 (and described more fully below). Upon insertion of the ink supply 20, an actuator 40 within the docking bay 38 is brought into contact with the pump 26 through aperture 34. In addition, a fluid inlet 42 within the docking bay 38 is coupled to the container fluid outlet 28 through aperture 36, thereby to create an ink delivery path from the ink supply 20 to the corresponding pen on the printer carriage. Operation of the actuator 40 causes the pump 26 to draw ink from the reservoir and deliver the ink through the fluid outlet 28 and the fluid inlet 42 to the ink-jet pen through a tube, as discussed below.

[0024] Upon depletion of the ink from the reservoir 24, or for any other reason, the ink supply 20 can be easily removed from the docking bay 38. Upon removal, the fluid outlet 28 on the container and the fluid inlet 42 of the docking station close to prevent any residual ink from leaking into the printer or onto the user. The ink supply container may then be discarded or stored for reinstallation at a later time. In this manner, the ink supply 20 provides a user of an ink jet printer a simple, economical way to provide a reliable, and easily replaceable supply of ink to an ink-jet printer.

[0025] As illustrated in Figures 2 and 7, the chassis 22 has a main body 44. Extending upward from the top of the chassis body 44 is a frame 46 which helps define and support the ink reservoir 24. In the illustrated embodiment, the frame 46 defines a generally square reservoir 24. Each side of the frame 46 is provided with a face 48 to which a sheet of plastic 50 is attached to enclose the sides of the reservoir 24. The illustrated plastic sheet is flexible to allow the volume of the reservoir to diminish as ink is depleted from the reservoir. This helps to allow withdrawal and use of all of the ink within the reservoir by minimizing the amount of backpressure created as ink is depleted from the reservoir. The illustrated ink supply 20, is intended to contain about 30 cubic centimeters of ink when full.

[0026] In the illustrated embodiment, the plastic sheets 50 are heat staked to the faces 48 of the frame in a manner well known to those in the art. The plastic sheets 50 are, in the illustrated embodiment, multi-ply sheets having a an outer layer of low density polyethylene, a layer of adhesive, a layer of metallized polyethylene terephthalate, a layer of adhesive, a second layer of metallized polyethylene terephthalate, a layer of adhesive, and an inner layer of low density polyethylene. The layers of low density polyethylene are about 0.0127mm (0.0005 inches) thick and the metallized polyethylene terephthalate is about 0.0122 mm (0.00048 inches) thick. The low density polyethylene on the inner and outer sides of the plastic sheets can be easily heat staked to the frame while the double layer of metallized polyethylene terephthalate provides a robust barrier against vapor loss and leakage. Of course, in other embodiments, different materials, alternative methods of attaching the plastic sheets to the frame, or other types of reservoirs might be used.

[0027] The body 44 of the chassis 22, as seen in Figures 2 and 7, is provided with a fill port 52 for filling the reservoir 24. After filling the reservoir, a spherical plug 54 is inserted into the fill port 52 to prevent the escape of ink through the fill port. In the illustrated embodiment, the plug is a polypropylene ball that is press fit into the fill port.

[0028] The pump 26 on the chassis 22 serves to pump ink from the reservoir and supply it to the printer via the fluid outlet 28. In the illustrated embodiment, the pump 26 includes a pump chamber 56 that is integrally formed with the chassis 22. The pump chamber is defined by a skirt-like wall 58 which extends downwardly from the body 44 of the chassis 22.

[0029] A pump inlet 60 is formed at the top of the chamber 56 to allow fluid communication between the chamber 56 and the ink reservoir 24. A pump outlet 62 through which ink may be expelled from the chamber 56 is also provided. A valve 64 is positioned within the pump inlet 60. The valve 64 allows the flow of ink from the ink reservoir 24 into the chamber 56 but limits the flow of ink from the chamber 56 back into the ink reservoir 24. In this way, when the chamber is depressurized, ink may be drawn from the ink reservoir, through the pump inlet and into the chamber. When the chamber is pressurized, ink within the chamber may be expelled through the pump outlet.

which engage two circumferential ribs 124 formed on the cap 32 to secure the cap to the shell. Sonic welding or some other mechanism may also be desirable to more securely fix the cap to the shell. In addition, a label can be adhered to both the cap and the shell to more firmly secure them together. A pressure sensitive adhesive is used to adhere the label in a manner that prevents the label from being peeled off and to help secure the cap to the shell.

[0042] The attachment between the shell and the cap should, preferably, be snug enough to prevent accidental separation of the cap from the shell and to resist the flow of ink from the shell should the ink reservoir develop a leak. However, it is also desirable that the attachment allow the slow ingress of air into the shell as ink is depleted from the reservoir to maintain the pressure inside the shell generally the same as the ambient pressure. Otherwise, a negative pressure may develop inside the shell and inhibit the flow of ink from the reservoir. The ingress of air should be limited, however, in order to maintain a high humidity within the shell and minimize water loss from the ink.

[0043] In the illustrated embodiment, the shell 12 and the flexible reservoir 14 which it contains have the capacity to hold approximately thirty cubic centimeters of ink. The shell is approximately 73 millimeters wide, 15 millimeters thick, and 60 millimeters high. Of course, other dimensions and shapes can also be used depending on the particular needs of a given printer.

[0044] The shell 30 is substantially symmetrical about its vertical central axis. Accordingly, the shell may be joined with the cap in either of two orientations of the shell, thereby simplifying the container assembly process.

[0045] In accordance with the present invention, it is contemplated that the components of the ink supply container, except for the protective cap 32, may be used to contain any of a number of different types of ink. One can divide types of ink, for example, into two subcategories: family and color. A family of ink refers to the particular chemical and physical properties of the ink, such as its viscosity or solubility in water. Ink-jet pens and print heads that are designed to work with ink of a particular family will malfunction if ink of a different family is used. The ink color relates to one of four colors that are typically used in color printing and combined on the printing medium to yield the sought-after color output. In this regard, the ink delivery system for providing ink to the print head is limited to use with only one color and, therefore, must not be contaminated with ink of another color.

[0046] The protective cap 32 of the present invention includes features formed thereon to provide indicia of the particular single family and color of the ink contained in the reservoir. Similar features are provided in the docking station bays. These features on the ink container and in the docking station bays are the primary components of a system that prevents insertion of any ink containers into a particular bay, except for the single ink supply container that has a cap bearing the appropriate features for mating with corresponding features of the particular bay.

[0047] In accordance with the present invention, one end of the cap 32 is provided with features comprising projecting keys 130 that can identify the family of ink contained within the ink supply. For example, if the ink supply is filled with ink suited for use only with a particular printer or family of printers, a cap having keys of a selected number and spacing (in the illustrated embodiment, three evenly spaced keys 130 are shown) for indicating that ink family is contained in the supply. The other end of the cap is provided with a feature, a keyway 131, that is indicative of a certain color of ink, such as cyan, magenta, etc. As will be explained below, the docking station in the printer carries features that mate with those on a cap to control the insertion of the containers into the station.

[0048] It is notable here that the chassis 22 and shell 30 can be manufactured, assembled and stored without regard to the particular type of ink they will contain. Then, after the ink reservoir is filled, a cap bearing features indicative of the particular ink type within the reservoir is attached to the shell. This allows for manufacturing economies because a supply of empty shells and chassis can be stored in inventory. When there is a demand for a particular type of ink, that ink can be introduced into the ink supply and an appropriate cap fixed to the ink supply. Thus, this scheme reduces the need to maintain high inventories of ink supplies containing every type of ink.

[0049] Alternative or supplementary ink content indicia may be incorporated into the cap. For example, when the ink supply is filled with a particular color of ink, a cap that is colored to match that color may be used. The color of the cap may also be used to indicate the family of ink contained within the ink supply.

[0050] The illustrated ink supply 20 is ideally suited for insertion into a docking station 132 like that illustrated in Figures 4-7. The docking station 132 illustrated in Figure 4, is intended for use with a color printer. Accordingly, it has four side-by-side docking bays 38, each of which can receive one ink supply container 20 of a different color. The structure of the illustrated ink supply allows for the supply to be relatively narrow in width. This allows for four ink supplies to be arranged side-by-side in a compact docking station without unduly increasing the "footprint" of the printer.

[0051] The docking bays 38 reside between opposing walls 134, 136 of the station. Each wall respectively defines four inwardly facing vertical channels 138a-d, 140a-d. Each bay 38 (the upper boundary of one bay is shown in dashed lines in Figures 4-6) receives one ink supply 20.

[0052] A leaf spring 142 having an engagement prong 144 is positioned within the lower portion of each channel 138a-d, 140a-d. The engagement prong 144 of each

is in fluid communication therewith. The trailing tube 169 leads to a print head (not shown).

[0063] A sliding collar 170 surrounds the needle 162 and is biased upwardly by a spring 172. The sliding collar 170 has a compliant sealing portion 174 with an exposed upper surface 176 and a lower surface 178 in direct contact with the spring 172. In addition, the illustrated sliding collar includes a substantially rigid portion 180 extending downwardly to partially house the spring 172. An annular stop 182 extends outward from the lower edge of the substantially rigid portion 180. The annular stop 182 is positioned beneath the base plate 146 such that it abuts the base plate to limit upward travel of the sliding collar 170 and define an upper position of the sliding collar on the needle 162. In the upper position, the lateral hole 168 is surrounded by the sealing portion 174 of the collar to seal the lateral hole, and the blunt end 164 of the needle is generally even with the upper surface 176 of the collar.

[0064] To install an ink supply 20 within a docking bay 38, a user can simply place the lower end of the mating ink supply container between the opposing walls 134 and 136 that define a mating bay 38 (Figure 6). The ink supply is then pushed downward into the installed position, shown in Figure 7, in which the bottom of the cap 32 abuts the base plate 146. As the ink supply is pushed downward, the fluid outlet 28 and fluid inlet 42 automatically engage and open to form a path for fluid flow from the ink supply to the printer. Once the supply is installed, the actuator may enter the aperture 34 in the cap 32 to pressurize the pump.

[0065] Once in position, the engagement prongs 144 on each side of the docking station engage the detents 118 formed in the shell 30 to firmly hold the ink supply in place. The leaf springs 142, which allow the engagement prongs to move outward during insertion of the ink supply, bias the engagement prongs inward to positively hold the ink supply in the installed position. Throughout the installation process and in the installed position, the edges of the ink supply 20 are captured within the vertical channels 138 and 140 which provide lateral support and stability to the ink supply. The above-described keying components formed in bottom parts of the channels 138a-d and 140a-d are configured to provide clearance for the detents 118 and the central vertical ribs 116 formed in each side of the shell. In a preferred embodiment, the depth (measured left-to-right in Figure 5) is sufficient to provide clearance for the detent 118 and rib 116, which may protrude outwardly slightly farther than the end of the cap 32. Similarly, the depth of the central one of the three keyways 143 in the right station wall 136 is sufficiently deep to provide clearance for the detent 118 and rib 116 on that side of the supply container.

[0066] To remove the ink supply 20, a user simply grasps the ink supply, using the contoured gripping surfaces 114, and pulls upward to overcome the force of the leaf springs 142. Upon removal, the fluid outlet 28 and fluid inlet 42 automatically disconnect and reseal leaving little, if any, residual ink and the pump 26 is depressurized to reduce the possibility of any leakage from the ink supply.

Claims

1. An apparatus for locating an ink supply container in an ink-jet printer, the apparatus comprising:

   a plurality of ink supply containers (20) each of which includes an end cap attached to a shell defining on one end of the cap a first keying component (130) indicative of the family of ink to be contained in the container and defining on the other end of the cap a second keying component (131) indicative of the colour of the ink to be contained in the container;

   a docking station (132) connected to the printer, the docking station having wall members that define a plurality of bays (38), each bay configured to mate with the first and second keying components of said supply container (20) that is inserted into the bay (38) and that contains a keyed colour and family of ink corresponding to that particular bay (38);

   wherein, each bay (38) of the docking station includes an inlet (42) and wherein each container includes an outlet (28) that can couple with an inlet, and wherein the first and second keying components are provided on the end caps of the containers located to index both the correct colour and family of ink contained in the container and to guide insertion of a mating container into its mating bay so that the inlet of the mating bay couples with the outlet of the mating container.

2. The apparatus of claim 1, wherein the first and second keying components comprise elongated members that constrict movement of the mating container within a mating bay to sliding transitional movement.

3. The apparatus of claim 1, wherein the keying system further comprises a detent member (118) on each container and a prong member (144) on each bay (38), the prong member engaging the detent member to resist removal of the container from the bay.

4. The apparatus of claim 3, wherein the location and configuration of the detent members on each container and the prong members on each bay are substantially identical irrespective of variations in the location and configuration of the first and second keying components among the containers and

Schaffen eines Deckels (32);

Bilden, an dem Deckel, eines Merkmals (130, 131) an einer vorbestimmten Stelle an dem Deckel, wobei die Stelle sowohl die Familie als auch die Farbe eines bestimmten Tintentyps anzeigt; und

Schaffen eines Gehäuses (30) zum Enthalten eines Tintenreservoirs, wobei dem Gehäuse jegliche wahrnehmbaren Indizien des Tintentyps fehlen, der in dem Reservoir enthalten sein soll, und Anbringen des Dekkels an dem Gehäuse.

7. Das Verfahren gemäß Anspruch 6, bei dem der Anbringungsschritt ein Abdecken eines Tors mit dem Deckel (32) umfaßt, das zum Füllen des Reservoirs verwendet wird.

8. Ein Tintenvorratsbehälter zum Zuführen von Tinte zu einem Tintenstrahldrucker, wobei der Behälter folgende Merkmale aufweist:

einen Deckel (32);

ein Merkmal (130, 131) an einer oder mehreren vorbestimmten Stellen an dem Deckel, wobei die Stellen die Familie und Farbe eines bestimmten Tintentyps anzeigen; und

ein Gehäuse (30) zum Enthalten eines Tintenreservoirs, wobei dem Gehäuse jegliche wahrnehmbaren Indizien des Tintentyps, der in dem Reservoir enthalten sein soll, fehlen, und wobei das Gehäuse an dem Dekkel angebracht ist.

Revendications

1. Appareil pour positionner un récipient d'alimentation en encre dans une imprimante à jet d'encre, l'appareil comprenant:

- une pluralité de récipients d'alimentation en encre (20), dont chacun inclut un capuchon d'extrémité fixé à une coque définissant sur une extrémité du capuchon un premier composant de détrompage (130) indicatif de la famille de l'encre devant être contenue dans le récipient et définissant sur l'autre extrémité du capuchon un deuxième composant de détrompage (131) indicatif de la couleur de l'encre devant être contenue dans le récipient;
- une station d'accueil (132) connectée à l'imprimante, la station d'accueil ayant des éléments de paroi qui définissent une pluralité de baies (38), chaque baie étant configurée pour s'apparier avec les premier et deuxième éléments de détrompage dudit récipient d'alimentation (20) qui est inséré dans la baie (38) et qui contient une couleur et une famille d'encre codées par détrompeur correspondant à cette baie particulière (38);

dans lequel chaque baie (38) de la station d'accueil inclut une entrée (42) et dans lequel chaque récipient inclut une sortie (28) qui peut s'apparier avec une entrée, et dans lequel les premier et deuxième composants de détrompage sont prévus sur les capuchons d'extrémité des récipients positionnés pour indexer à la fois la couleur et la famille correctes d'encre contenue dans le récipient et pour guider l'insertion d'un récipient conjugué dans sa baie conjuguée de sorte que l'entrée de la baie conjuguée s'apparie avec la sortie du récipient conjugué.

2. Appareil selon la revendication 1, dans lequel les premier et deuxième composants de détrompage comprennent des éléments allongés qui restreignent le mouvement du récipient conjugué à l'intérieur d'une baie conjuguée en un mouvement de transition coulissant.

3. Appareil selon la revendication 1, dans lequel le système de détrompage comprend de plus un élément de cran (118) sur chaque récipient et un élément de griffe (144) sur chaque baie (38), l'élément de griffe étant en prise avec l'élément de cran pour résister au retrait du récipient de la baie.

4. Appareil selon la revendication 3, dans lequel le positionnement et la configuration des éléments de cran sur chaque récipient et des éléments de griffe sur chaque baie sont sensiblement identiques sans tenir compte des variations dans le positionnement et la configuration des premier et deuxième composants de détrompage parmi les récipients et les baies.

5. Appareil selon la revendication 1, dans lequel le premier composant de détrompage (130) comprend au moins une clé et dans lequel le deuxième composant de détrompage (131) comprend une rainure de détrompeur.

6. Procédé pour fabriquer un récipient d'alimentation en encre pour inclure des particularités indicatives du type d'encre contenue dans le récipient, le procédé comprenant les étapes consistant:

- à fournir un capuchon (32);
- à former sur le capuchon une particularité (130, 131) à un emplacement prédéterminé sur le capuchon, dans lequel l'emplacement est indicatif à la fois de la famille et de la couleur d'un type

FIG. 1

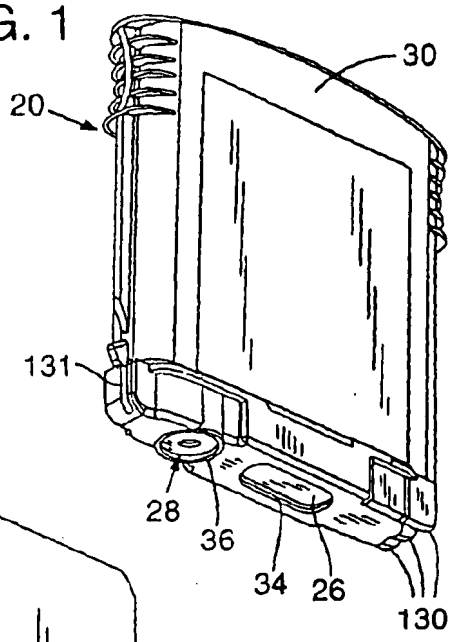
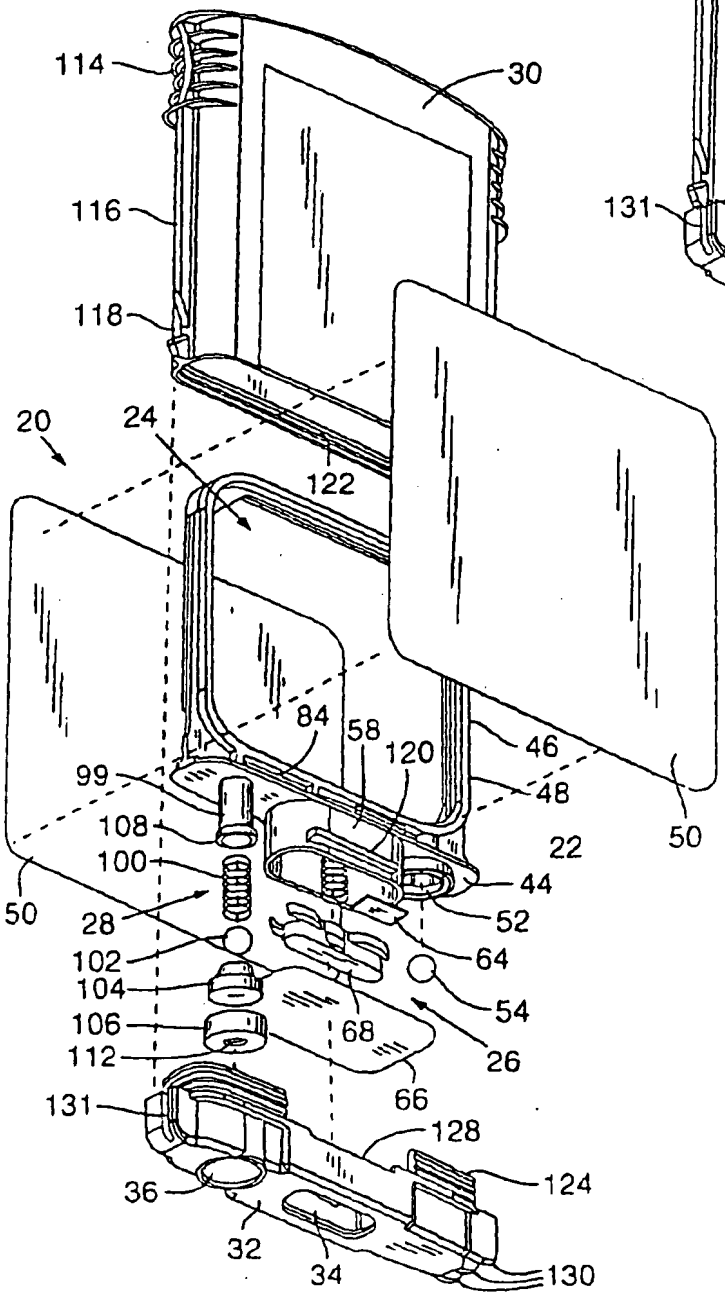

30
20
131
28
36
34
26
130

FIG. 2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116
118
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24
122
84
58
120
46
99
48
108
22
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100
44
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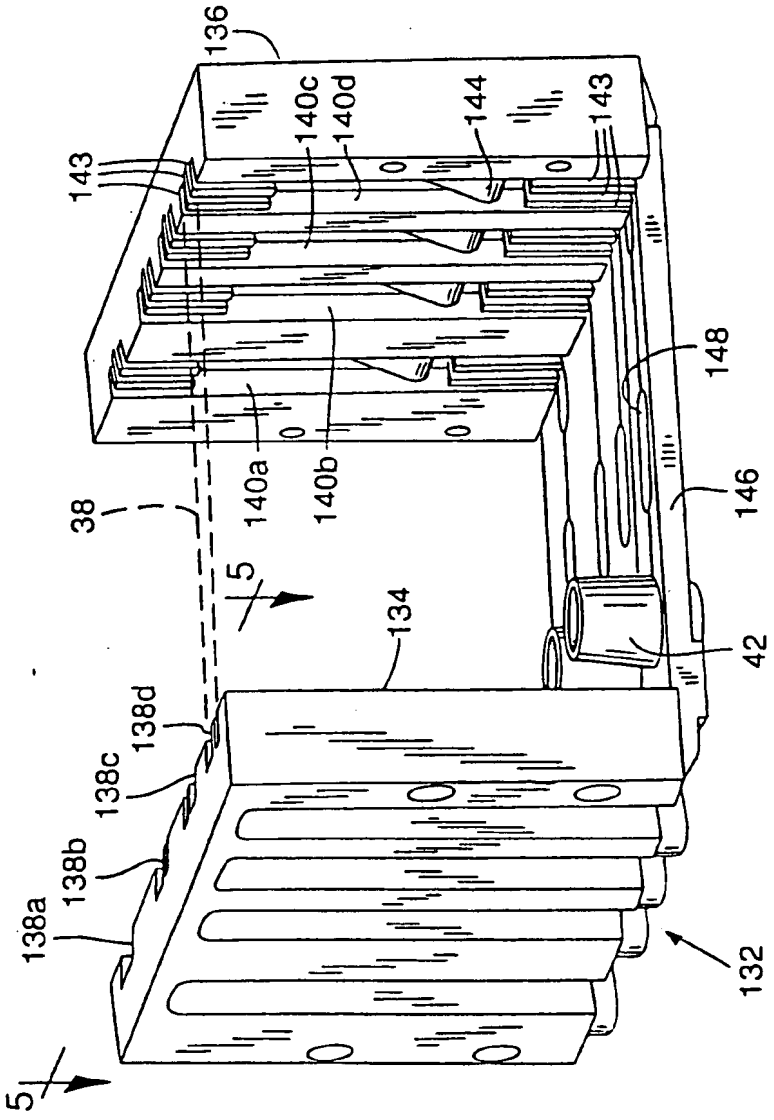
26
112
66
131
128
124
36
32
34
130


136
140c
140d
144
143
143
148
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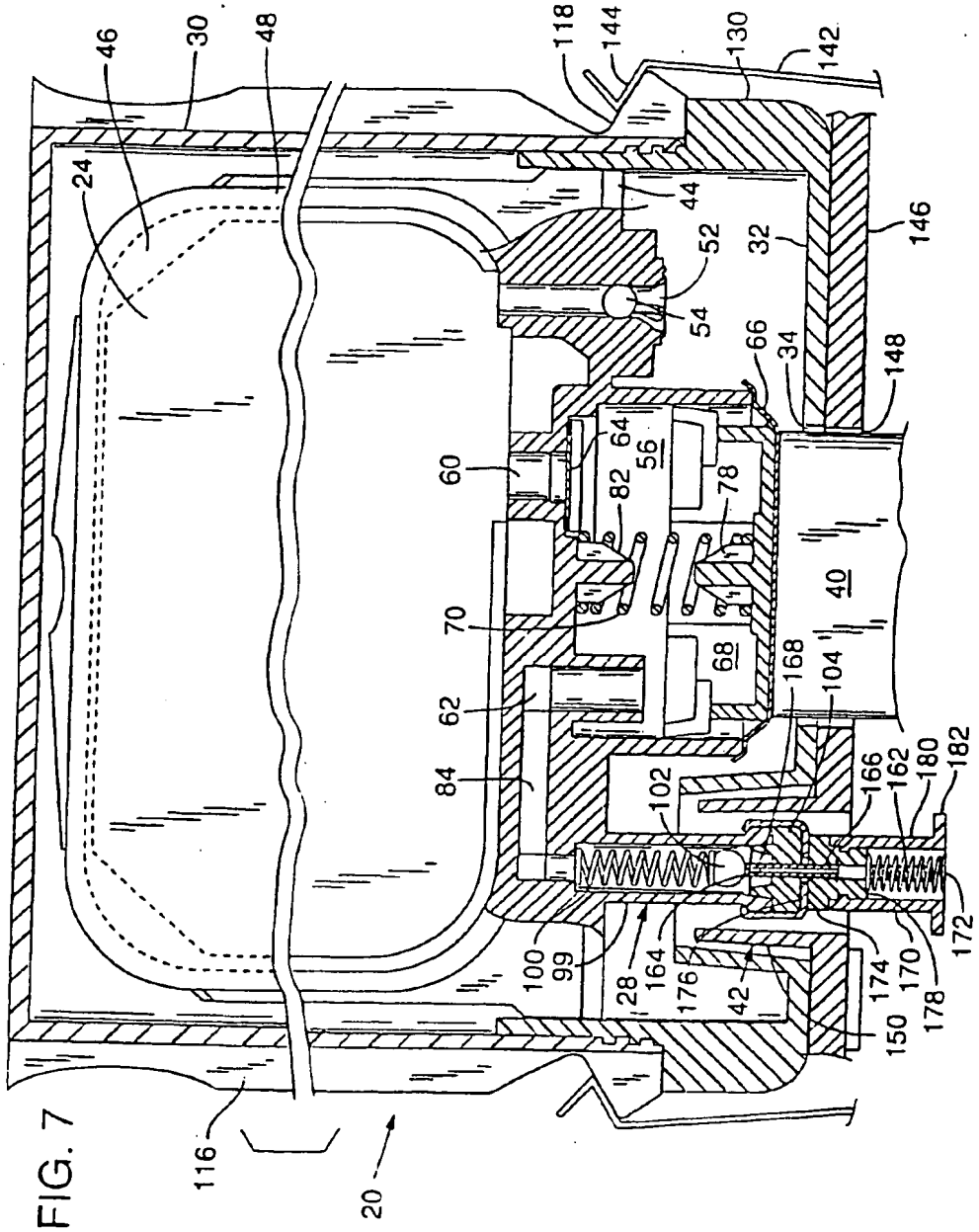
140b
38
146
5
134
42
138d
138c
138b
138a
132
5

FIG. 4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78
40
70
68
168
104
62
166
162
180
182
84
102
100
99
28
164
176
42
174
170
172
178
150
116
20

FIG. 7